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Approval

SAMSUNG ELECTRONICS

Customer : Mitsubishi **DATE : 9. Aug. 2011**

SAMSUNG TFT-LCD

MODEL : **LTA400HV02**

Customer's *Approval*	
SIGNATURE	DATE

APPROVED BY	DATE
Heo Jeongmin	9. Aug. 2011
PREPARED BY	DATE
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LCD Business

Samsung Electronics Co . , LTD.

Contents

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Revision History

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Date	Rev. No	Page	Summary
9. Aug. 2011	000	all	First issued

General Description

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Description

LTA400HV02 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT(Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit. The resolution of a 40.0“ is 1920 x 1080 and this model can display up to 1.07 Billion colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide a excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV

Features

- RoHS compliance (Pb-free)
- High contrast ratio & aperture ratio with wide color gamut
- S-PVA (Super Patterned Vertical Align) mode
- Wide viewing angle (± 178°)
- High speed response
- FHD resolution (16:9)
- Low Power consumption
- Edge Type LED (Light Emitted Diode) BLU
- DE (Data Enable) mode
- 2D : 4CH_LVDS 10Bit Input Interface
- 3D : 4CH_LVDS 10Bit Input Interface
  (Left Eye: 2Ch 60Hz FHD, Right Eye: 2Ch 60Hz FHD)

General Information

Items	Specification	Unit	Note
Module Size	912.4 (H_{TYP}) x 536.3(V_{TYP})	mm	± 1.0mm
	33.2 (D_{Max})		+2.0/-1.0mm
Weight	10000 (Max)	g	
Pixel Pitch	0.46125(H) x 0.46125(W)	mm	
Active Display Area	885.6(H) x 498.15(V)	mm	
Surface Treatment	Haze 5.5%, Hard Coating 2H		Anti Glare
Display Colors	8bit + FRC – 1.07 Billion	colors	
Number of Pixels	1920 x 1080	pixel	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Luminance of White	400 (Typ.)	cd/m^2	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	GND-0.5	13.2	V	(1)
Storage temperature	T_{STG}	-20	60	℃	(2)
Surface temperature	T_{SUR}	0	60	℃	
Operating temperature	T_{OPR}	0	50	℃	
Shock (non - operating)	X,Y,Z	-	50	G	(3)
Vibration (non - operating)	V_{NOP}	-	1.5	G	(4)

Note (1) Ta= 25 ± 2 ℃
(2) Temperature and relative humidity range are shown in the figure below.
a. 90 % RH Max. (Ta ≤ 39 ℃)
b. Relative Humidity is 90% or less. (Ta > 39 ℃)
c. No condensation
(3) 11ms, sine wave, one time for ± X, ± Y, ± Z axis
(4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

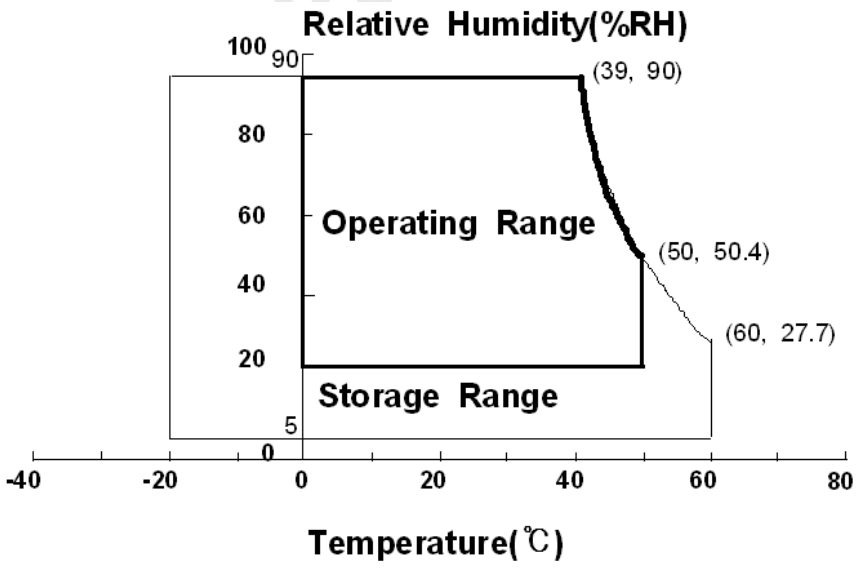

Fig. Temperature and Relative humidity range

2. Optical Characteristics

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The optical characteristics should be measured in a dark room or equivalent.
Measuring equipment : TOPCON RD-80S, TOPCON SR-3, ELDIM EZ-Contrast

(Ta = 25 ± 2℃, VDD=12V, fv= 60Hz, f_{DCLK} = 148.5MHz, LED Current = 130mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)		C/R		3000	5000	-		(1) SR-3
Response Time	G-to-G	Tg	Normal qL,R =0 qU,D =0 Viewing Angle	-	-	15	msec	(3) RD-80S
Luminance of White (Center of screen)		Y_L		300	400	-	cd/m²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Rx		TYP. -0.03	0.651	TYP. +0.03		(5),(6) SR-3
		Ry			0.334			
	Green	Gx			0.307			
		Gy			0.609			
	Blue	Bx			0.150			
		By			0.059			
	White	Wx			0.280			
		Wy			0.290			
Color Gamut		-		-	72	-	%	(5) SR-3
Color Temperature		-		-	10,000	-	K	
Viewing Angle	Hor.	q_L	C/R≥10	75	89	-	Degree	(6) EZ-Contrast
		q_R		75	89	-		
	Ver.	q_U		75	89	-		
		q_D		75	89	-		
White Brightness Uniformity (9 Points)		B_{uni}		-	-	30	%	(2) SR-3

- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of screen.

Environment condition : Ta = 25 ± 2 ℃

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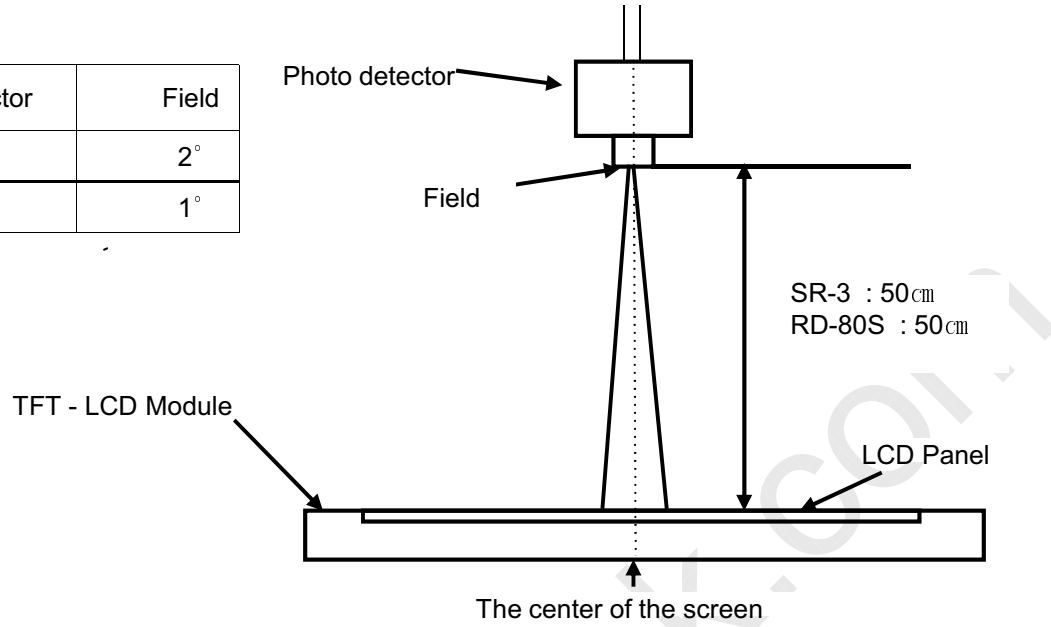
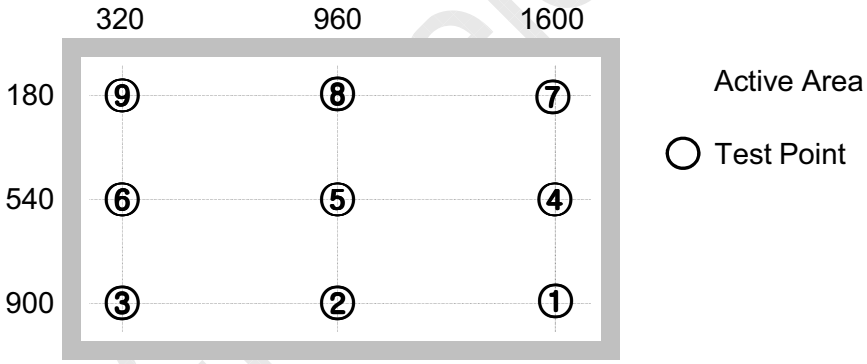
Photo detector	Field
SR-3	2°
RD-80S	1°



- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)
: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C/R = \frac{G\max}{G\min}$$

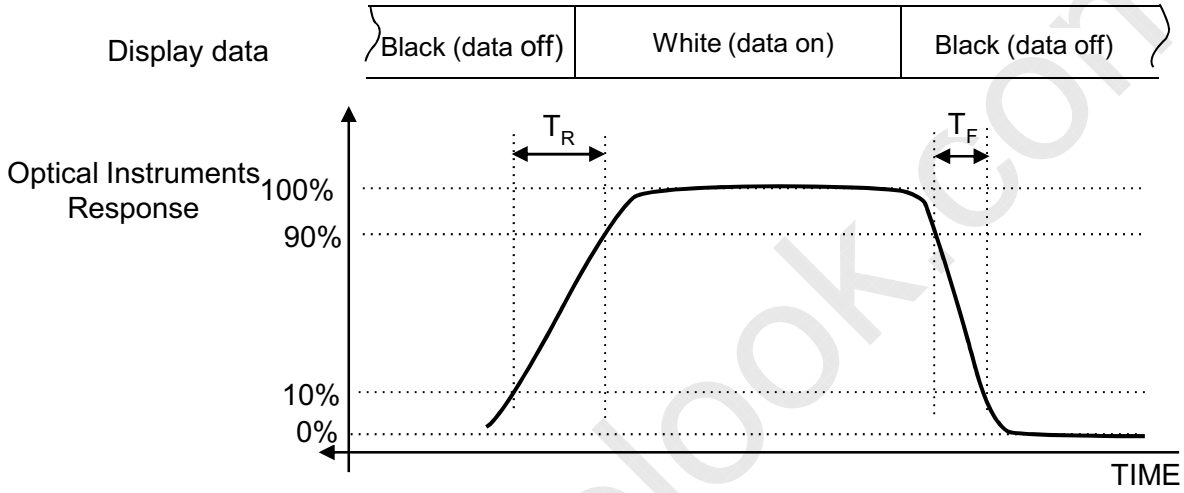
Gmax : Luminance with all pixels white
Gmin : Luminance with all pixels black

Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$Buni = 100 * \frac{(B\max - B\min)}{B\max}$$

Bmax : Maximum brightness
Bmin : Minimum brightness

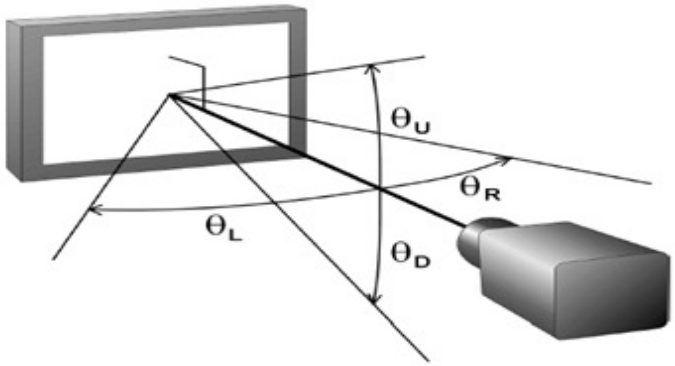
Note (3) Definition of Response time : Sum of Tr, Tf



Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)
Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle
: Viewing angle range (C/R ≥10)



3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

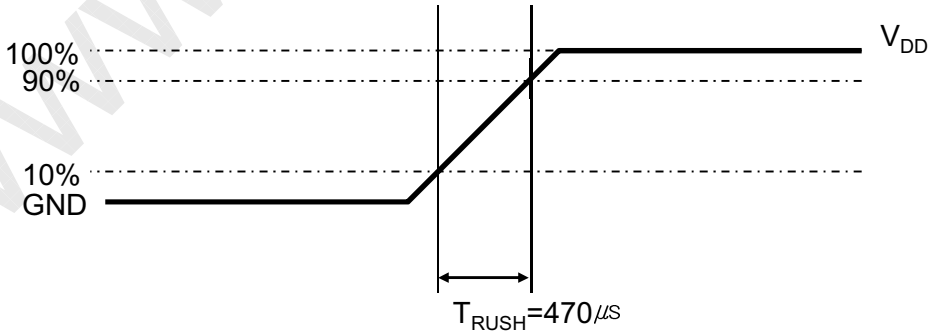
Ta = 25℃ ± 2 ℃

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	(a) Black	I_{DD}	-	900	-	mA	(2),(3)
	(b) White		-	930	-	mA	
	(c) Sub V-Stripe		-	1280	-	mA	
Vsync Frequency		f_V	-	120	-	Hz	
Hsync Frequency		f_H	-	135	-	kHz	
Main Frequency		f_{DCLK}	-	297	-	MHz	
Rush Current		I_{RUSH}	-	-	3	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD}.
(2) fV=120Hz, fDCLK =297MHz, V_{DD} = 12.0V, DC Current.
(3) Power dissipation check pattern (LCD Module only)

a) Black Pattern b) White Pattern c) Sub V-Stripe

(4) Measurement Conditions

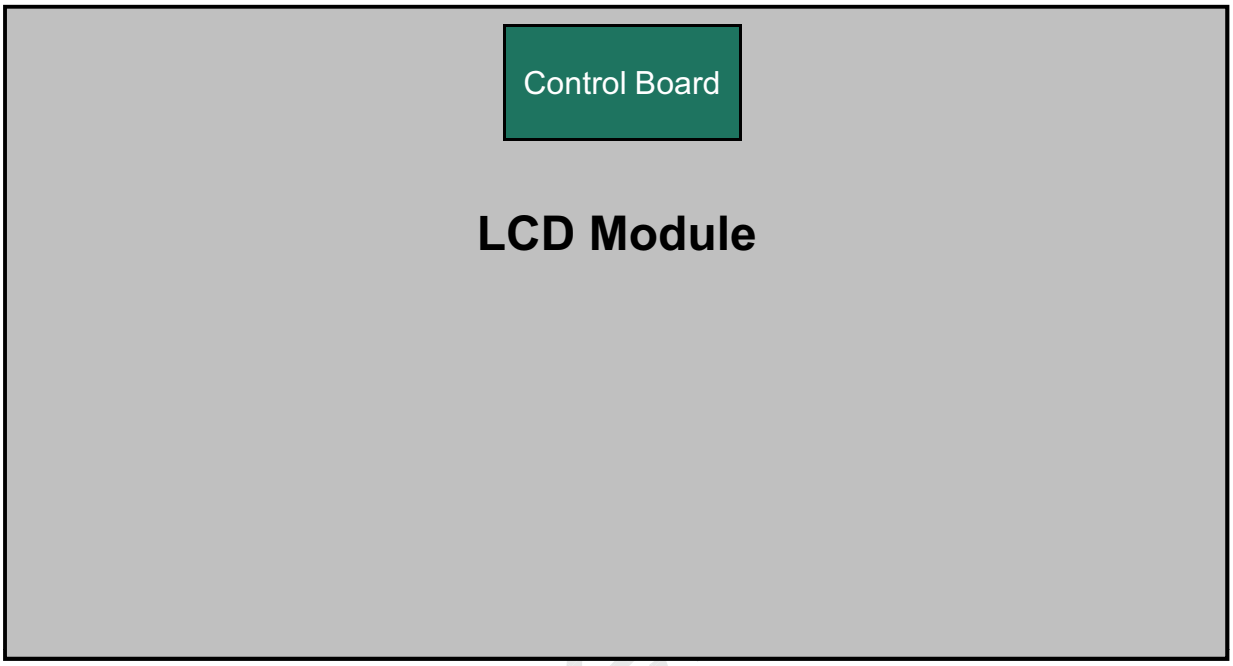


Rush Current I_{RUSH} can be measured when T_{RUSH}. is 470㎲.

3.2 Back Light Unit

The back light unit contains Edge type White LEDs (Light Emitting Diode)

Ta=25 ± 2℃



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	30,000	-	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value. [Operating condition : Ta = 25± 2℃, For LED Package only.]

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3.3 Converter Input Condition & Specification

Item	Symbol	Condition	Spec.			Unit	Note
			Min	Typ	Max		
Input Voltage	V_{in}		22	24.0	26	V	
Input Current note(*2)(*3)	$I_{inrush,N}$	V_{in}=24.0V, Dim=max 3D ENA=off	-	-	3.5	A_{dc}	Normal Mode
	$I_{inrush,B}$	V_{in}=24.0V 3D ENA=on	-	-	6.0	A_{dc}	Blinking Mode
Output Current note(*1)	$I_{LED,N}$	V_{in}=22~26V, dim=max 3D ENA=off	123.5	130	136.5	mA_{mean}	Normal Mode
	$I_{LED,B}$	V_{in}=22~26V 3D ENA=on	209	220	231	mA_{dc} note(*6)	Blinking Mode Active High Level
Backlight on/off Control	ENA	Enable	2.4	-	5.5	V	
		Disable	-0.3	-	0.8	V	
Error Out	Z_{Normal}	Normal	-	-	1.3k	Ω	
	$Z_{Abnormal}$	Abnormal	1	-	-	MΩ	open Collector
Internal PWM Dimming Mode	V_{dim}	V_{in}=22~26V	0	-	3.3	V	note(*4)(*5) $V_{ex\text{-}dim}$ pin(#14) → floating(N.C)
	f_{dim}		140	150	160	Hz	
	D_{dim} (duty)	V_{in}=22~26V,V_{dim}=3.3V	100	-	-	%	
		V_{in}=22~26V,V_{dim}=0V	1	-	-	%	
External PWM Dimming Mode	$V_{ex\text{-}dim}$	High Level	2.4	-	5.5	V	note(*4)(*5)(*6)(*7) V_{dim} pin(#13) → floating(N.C) Sync Cable should be floating(N.C)
		Low Level	-0.3	-	0.8	V	
	$f_{ex\text{-}dim}$	V_{in}=22~26V	95	-	200	Hz	
	$D_{ex\text{-}dim}$		1		100	%	
	t_{rising}		-	-	200	ns	
	$t_{falling}$		-	-	200	ns	

Note) Power Consumption is measured when 400 [cd/m] of luminance which is the typical luminance. Lamp Current is measured at the point before Lamp.

(*1) All data was approved after running 120 minutes.

(*2) Inrush is measured within BLU on 10㎳ after leaving the BLU as it is at least 1hr or more at room temperature(25℃)

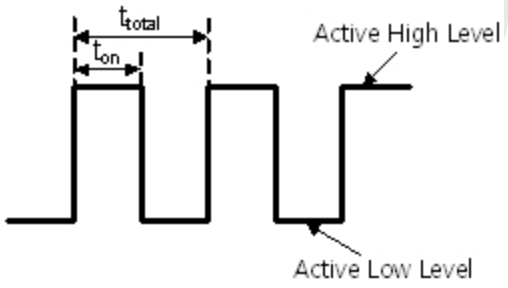
(*3) Additional Appendix for Input current

Item	Symbol	Condition	Spec.			단위	비고
			Min	Typ	Max		
Input Current (Normal Mode)	$I_{overshoot,N}$	V_{in}=24.0V, dim=max	-	3.1	3.2	A_{dc}	Overshoot Current after turn-on
	$I_{saturation,N}$		-	2.6	2.7	A_{dc}	Saturation Current after 1hr aging
Input Current (Blinking Mode)	$I_{overshoot,B}$	V_{in}=24.0V, 3D PWM=56%	-	4.3	4.5	A_{dc}	Overshoot Current after turn-on
	$I_{saturation,B}$		-	2.5	2.7	A_{dc}	Saturation Current after 1hr aging

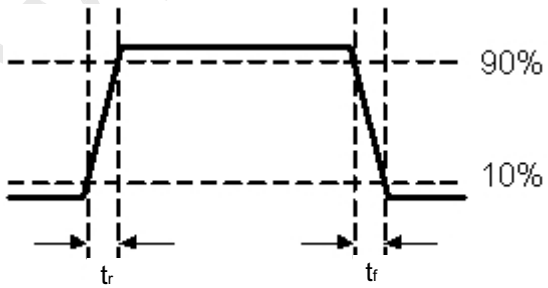
(*4) Internal PWM mode and External PWM mode are not available at the same time. In other words, if one of the dimming control signal was input (connected), the other dimming control signal must be floating (No Connection)
In case of External PWM mode, The Vsync Connector (Sync Cable) should be floating (N.C)

(*5) The f_{dim} and $f_{ex\text{-}dim}$ are only the operating assurance frequency.
Unless the frequency is optimized whine the operating frequency, waterfall can be occurred.

(*6) duty=ton/ttotal



(*7) signal rising/falling time



4. Input Terminal Pin Assignment

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4.1 Input Signal & Power

Connector 1: FI-RE41S-HF (JAE)

Pin	Description		Pin	Description	
1	Vdd (12V)		24	GND	
2	Vdd (12V)		25	Odd LVDS Signal	Rx3[0]N
3	Vdd (12V)		26		Rx3[0]P
4	Vdd (12V)		27		Rx3[1]N
5	Vdd (12V)		28		Rx3[1]P
6	N.C		29		Rx3[2]N
7	GND		30		Rx3[2]P
8	GND		31		GND
9	GND		32		RxCLK-
10	Odd LVDS Signal	Rx1[0]N	33		RxCLK+
11		Rx1[0]P	34		GND
12		Rx1[1]N	35		Rx3[3]N
13		Rx1[1]P	36		Rx3[3]P
14		Rx1[2]N	37		Rx3[4]N
15		Rx1[2]P	38		Rx3[4]P
16		GND	39	GND	
17		Rx1CLK-	40	N.C	
18		RxCLK+	41	N.C	
19		GND			
20		Rx1[3]N			
21		Rx1[3]P			
22		Rx1[4]N			
23		Rx1[4]P			

Note) (1) No Connection: This PINS are only used for SAMSUNG internal using.

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Connector 2 : FI-RE51S-HF (JAE)

Pin	Description		Pin	Description	
1	Vdd (12V)		26	Even LVDS Signal	Rx4[0]P
2	Vdd (12V)		27		Rx4[1]N
3	Vdd (12V)		28		Rx4[1]P
4	Vdd (12V)		29		Rx4[2]N
5	Vdd (12V)		30		Rx4[2]P
6	N.C		31		GND
7	GND		32		RECLK-
8	GND		33		RECLK+
9	GND		34		GND
10	Even LVDS Signal	Rx2[0]N	35		Rx4[3]N
11		Rx2[0]P	36		Rx4[3]P
12		Rx2[1]N	37		Rx4[4]N
13		Rx2[1]P	38		Rx4[4]P
14		Rx2[2]N	39	GND	
15		Rx2[2]P	40	I2C SCL	
16		GND	41	I2C SDA	
17		ROCLK-	42	3D_EN Signal	
18		ROCLK+	43	Bus release	
19		GND	44	N.C	
20		Rx2[3]N	45	N.C	
21		Rx2[3]P	46	N.C	
22		Rx2[4]N	47	N.C	
23		Rx2[4]P	48	3D_SYNC_I Shutter Glass Sync Input Signal	
24	GND		49	3D_SYNC_O Shutter Glass Sync Output Signal	
25	Even LVDS	Rx4[0]N	50	N.C	
			51	N.C	

Note) (1) No Connection: This PINS are only used for SAMSUNG internal using.

Note(2) Pin number starts from Right side

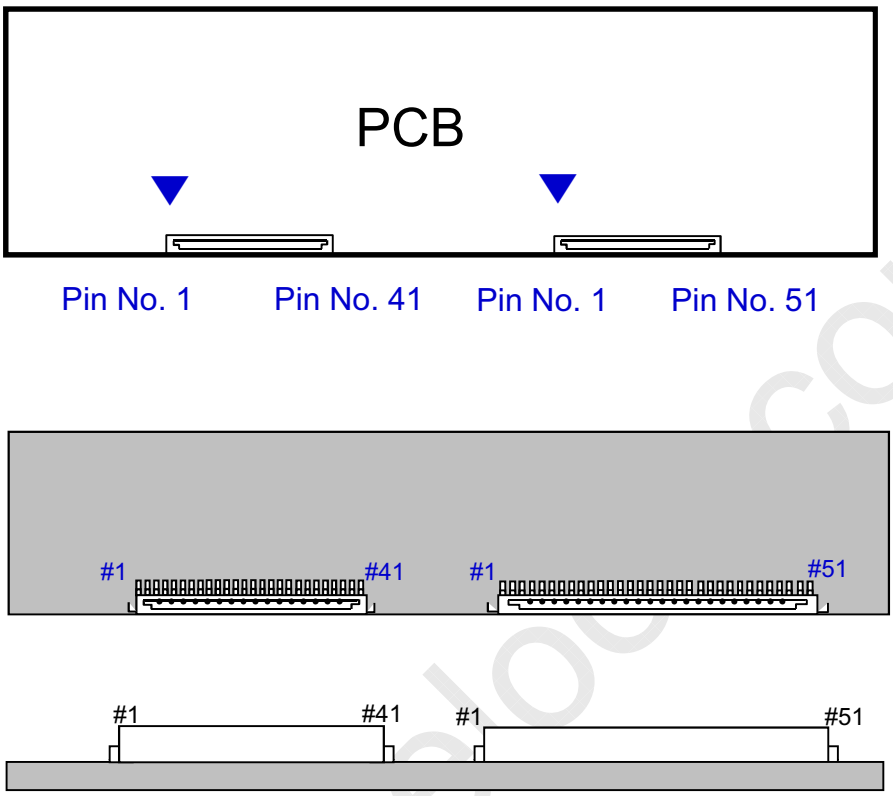


Fig. Connector diagram

a. All GND pins should be connected together and also be connected to the LCD's metal chassis.
b. All power input pins should be connected together.
c. All NC pins should be separated from other signal or power.

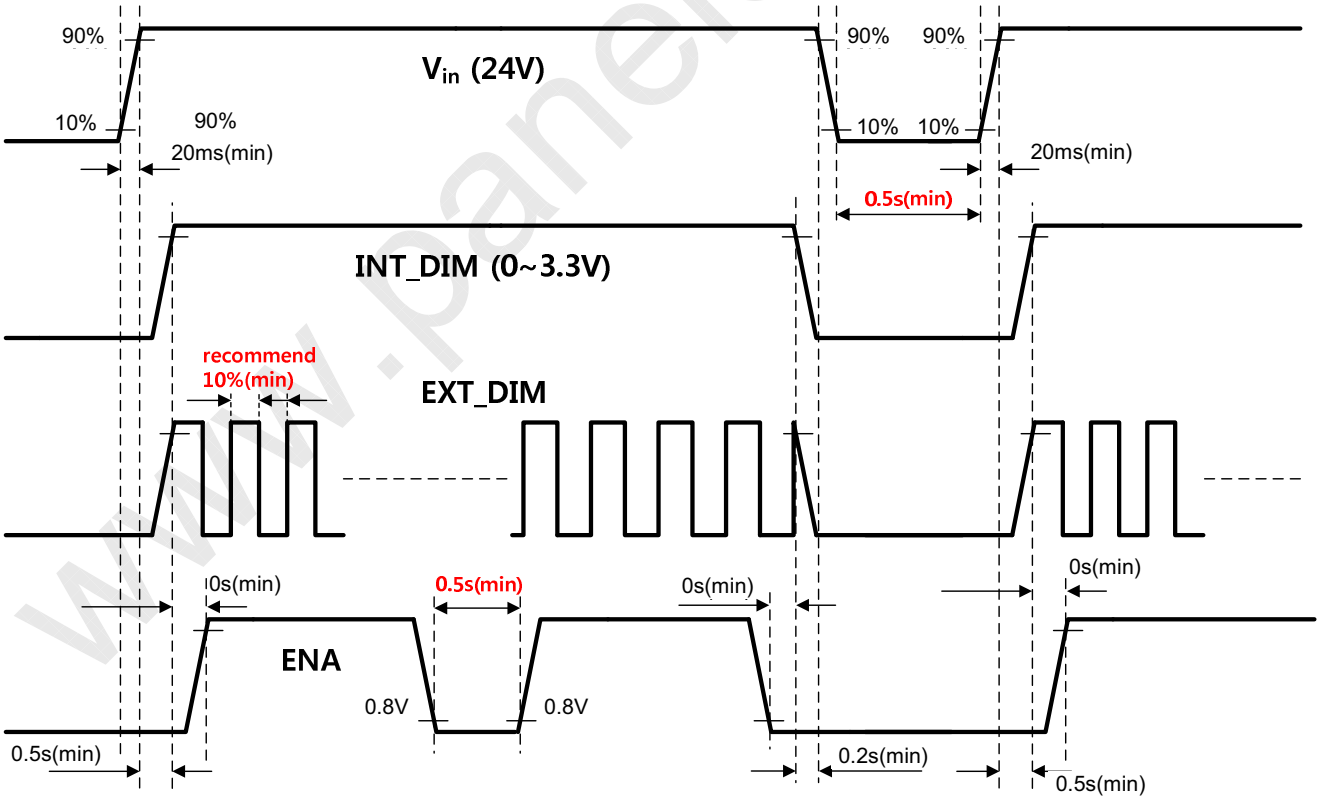
4.2. Converter Input Pin Configuration

Connector : Yeon-ho, 20022WR-14B1

Pin No.	Pin Configuration (FUNCTION)	Pin No.	Pin Configuration (FUNCTION)
1	24 V	8	GND
2	24 V	9	GND
3	24 V	10	GND
4	24 V	11	Error Out [Operation Status Output]
5	24 V	12	Converter On/Off Control Signal
6	GND	13	Dc Dimming Control Signal [0~3.3V] *Note(1)
7	GND	14	External PWM (In 3D mode : GND) [0~100%] *Note(1) (2)

Note(1) If use Dimming Control, Pin 14 Must be N.C
If use External PWM, Pin 13 Must be N.C
(2) If use 3D mode, Pin 14 Must be GND

4.3. Converter Input Power Sequence



4.4 LVDS Interface

- LVDS Receiver : Tcon (merged)
- Data Format (JEIDA Only)

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	LVDS pin	JEIDA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R4
	TxIN/RxOUT1	R5
	TxIN/RxOUT2	R6
	TxIN/RxOUT3	R7
	TxIN/RxOUT4	R8
	TxIN/RxOUT6	R9
	TxIN/RxOUT7	G4
TxOUT/RxIN1	TxIN/RxOUT8	G5
	TxIN/RxOUT9	G6
	TxIN/RxOUT12	G7
	TxIN/RxOUT13	G8
	TxIN/RxOUT14	G9
	TxIN/RxOUT15	B4
	TxIN/RxOUT18	B5
TxOUT/RxIN2	TxIN/RxOUT19	B6
	TxIN/RxOUT20	B7
	TxIN/RxOUT21	B8
	TxIN/RxOUT22	B9
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R2
	TxIN/RxOUT5	R3
	TxIN/RxOUT10	G2
	TxIN/RxOUT11	G3
	TxIN/RxOUT16	B2
	TxIN/RxOUT17	B3
	TxIN/RxOUT23	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0
	TxIN/RxOUT29	R1
	TxIN/RxOUT30	G0
	TxIN/RxOUT31	G1
	TxIN/RxOUT32	B0
	TxIN/RxOUT33	B1
	TxIN/RxOUT34	RESERVED

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4.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																														GRAY SCALE LEVEL
		RED										GREEN										BLUE										
		R0	R1	R2	R3	R4	R5	R6	R7	R8	R9	G0	G1	G2	G3	G4	G5	G6	G7	G8	G9	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~ R1020
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1021
		0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1022
	RED	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1023
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~ G1020
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1021
		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1022
	GREEN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	G1023
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~ B1020
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	B1021
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	B1022
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	B1023

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

5. UL Specification

-. This panel follows UL file – E252633
-. This panel achieved UL60065

6. Interface Timing

6.1 Timing Parameters (DE mode)

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	260	297	305	MHz	-
Hsync		F_H	120	135	140	KHz	-
Vsync		F_V	95	120	125	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1110	1125	1350	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2092	2200	2348	clocks	-

Note) This product is DE mode. But the Hsync & Vsync signal must be inputted

(1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
(2) Internal VDD = 3.3V
(3) Spread spectrum
- Modulation rate (max) : ± 1.5 %
- Modulation Frequency : Max 300KHz

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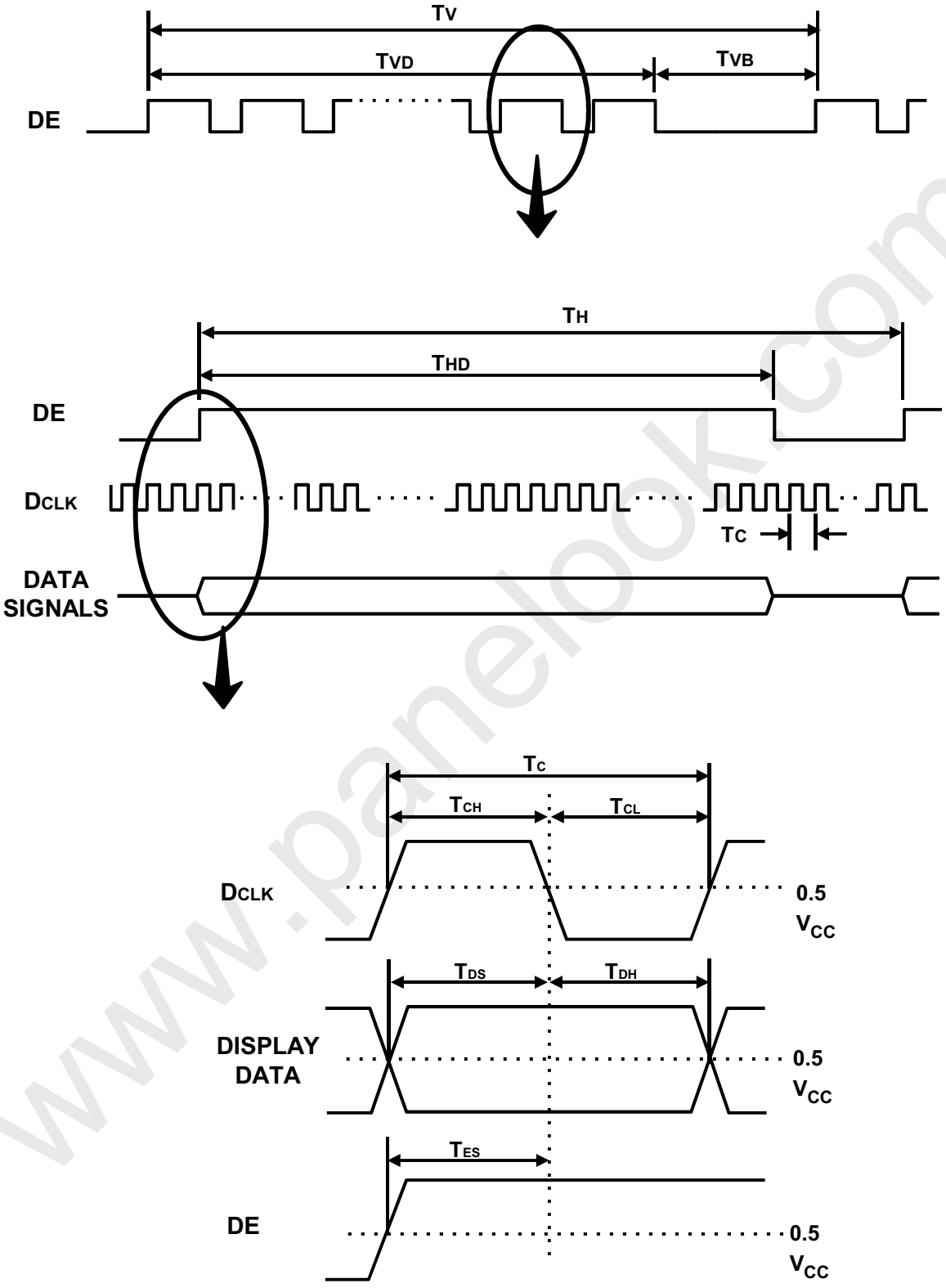
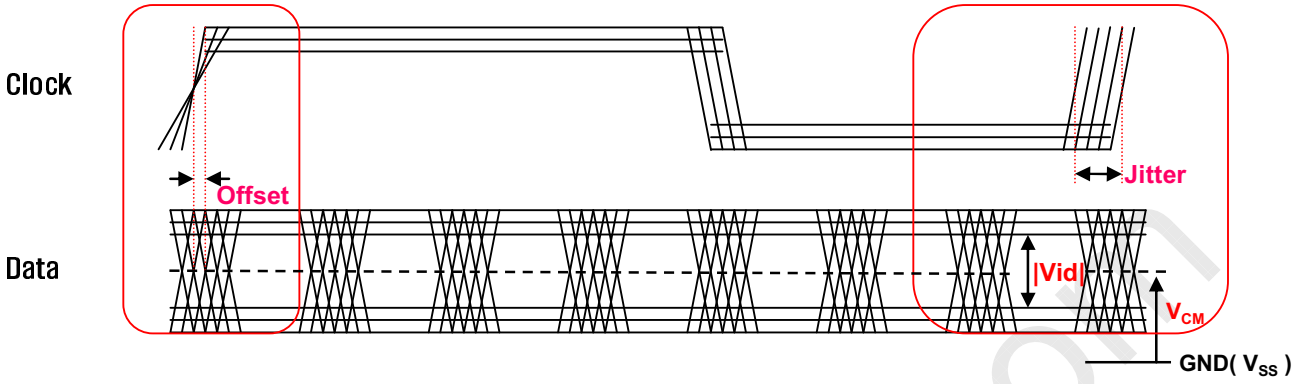
6.2 Timing diagrams of interface signal (DE mode)



6.3. LVDS Parameter Definition

LVDS Skew = Static Skew + Dynamic Skew = Offset ± Jitter/2

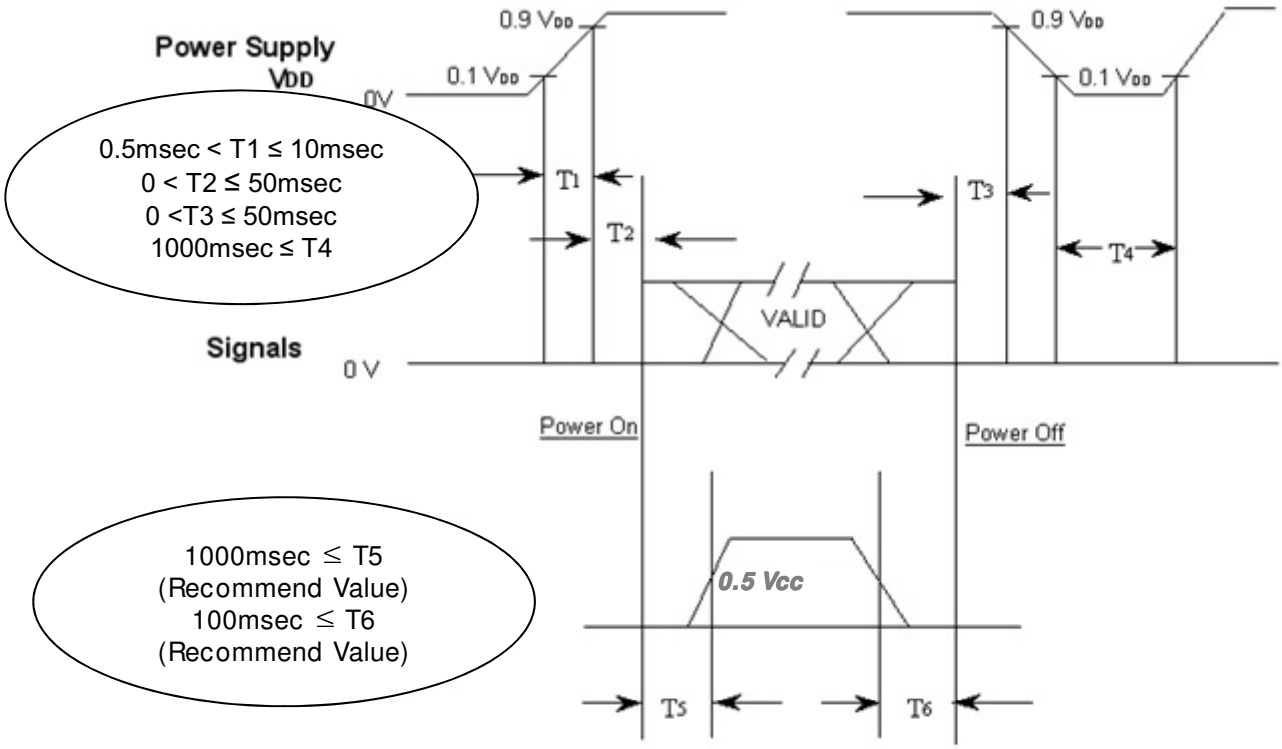


■ Test condition is during spread turn on

Items	SPEC		
	Min	Typ	Max
Skew [PS]	-500	-	+500
Vid [mV]	100	350	600
VCM [V]	0.3	-	1.8

6.4 Power ON/OFF Sequence

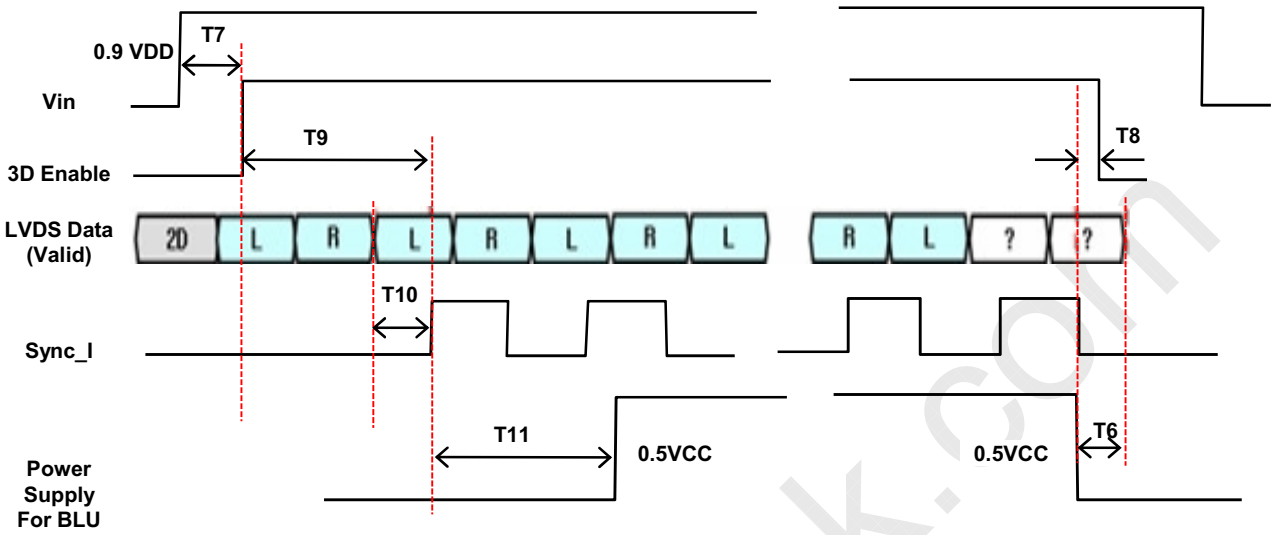
To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



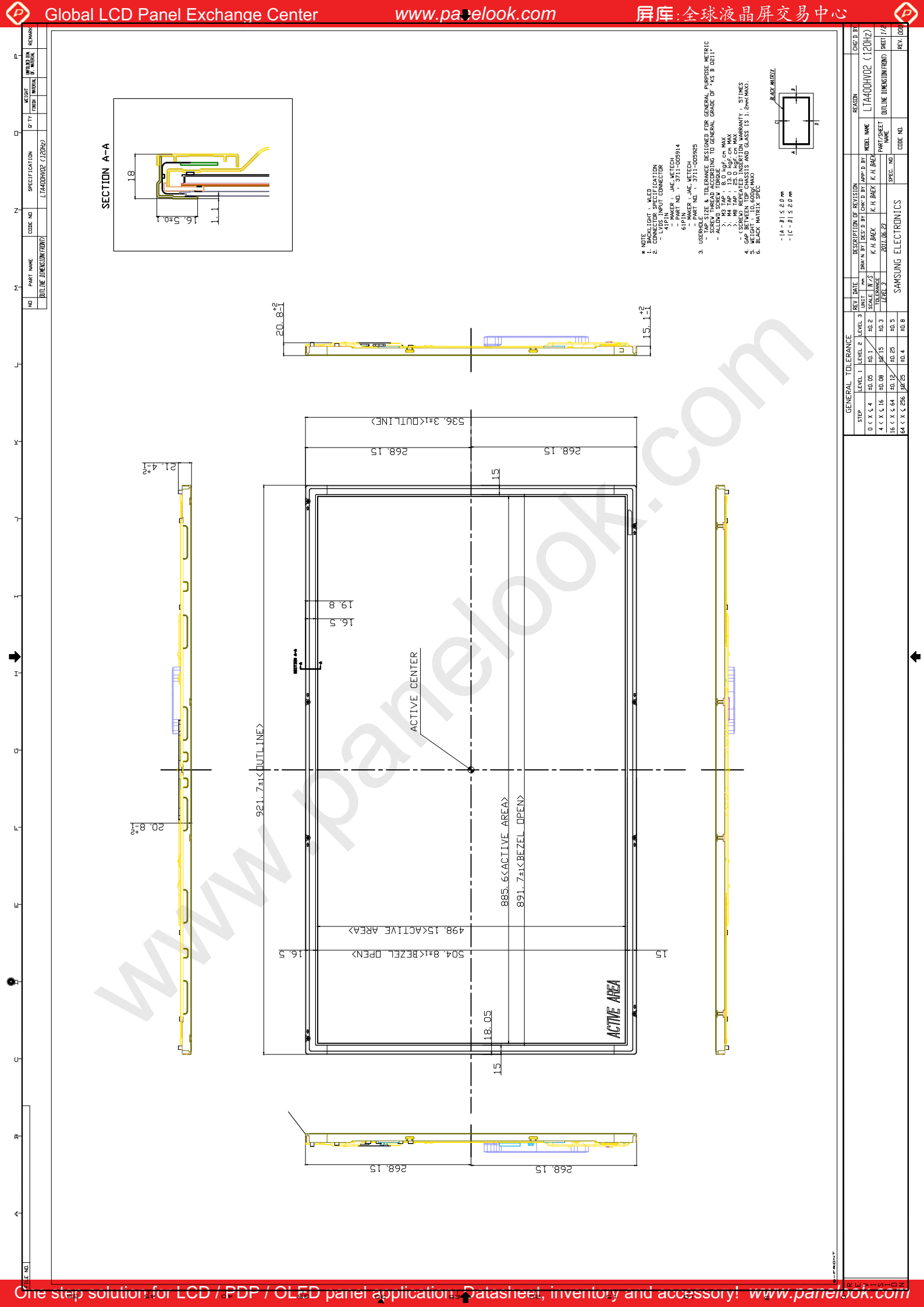
T1 : V_{DD} rising time from 10% to 90%
T2 : The time from V_{DD} to valid data at power ON.
T3 : The time from valid data off to V_{DD} off at power Off.
T4 : V_{DD} off time for Windows restart
T5 : The time from valid data to B/L enable at power ON.
T6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD}.
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of V_{DD} = off level, please keep the level of input signals low or keep a high impedance.
- T4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.
- In Case T5 is less than 1000msec and T6 is less than 100msec, Garbage Display can be seen. (It is not related to electrical function issue, Just for recommendation to prevent Garbage Display)

6.5 3D Mode Power Sequence



Items	SPEC
T6	≥100 msec
T7	≥2000 msec
T8	> 0 msec
T9	> 0 msec
T10	Min. 4.95 msec Typ. 5.00 msec Max. 5.05 msec
T11	≥1000 msec



NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT / FINISH	UNFOLDED DIM. / MATERIAL	REMARK
	OUTLINE DIMENSION(FRONT)		LTA400HV02 (120Hz)				

GENERAL TOLERANCE

STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X ≤ 4	±0.05	±0.1	±0.2
4 < X ≤ 16	±0.08	±0.15	±0.3
16 < X ≤ 64	±0.12	±0.25	±0.5
64 < X ≤ 256	±0.25	±0.4	±0.8

REV.	DATE	DESCRIPTION OF REVISION	DRAW'N BY	DES'D BY	CHK'D BY	APP'D BY
			K.H.BAEK	K.H.BAEK	K.H.BAEK	K.H.BAEK
			2011.06.22			

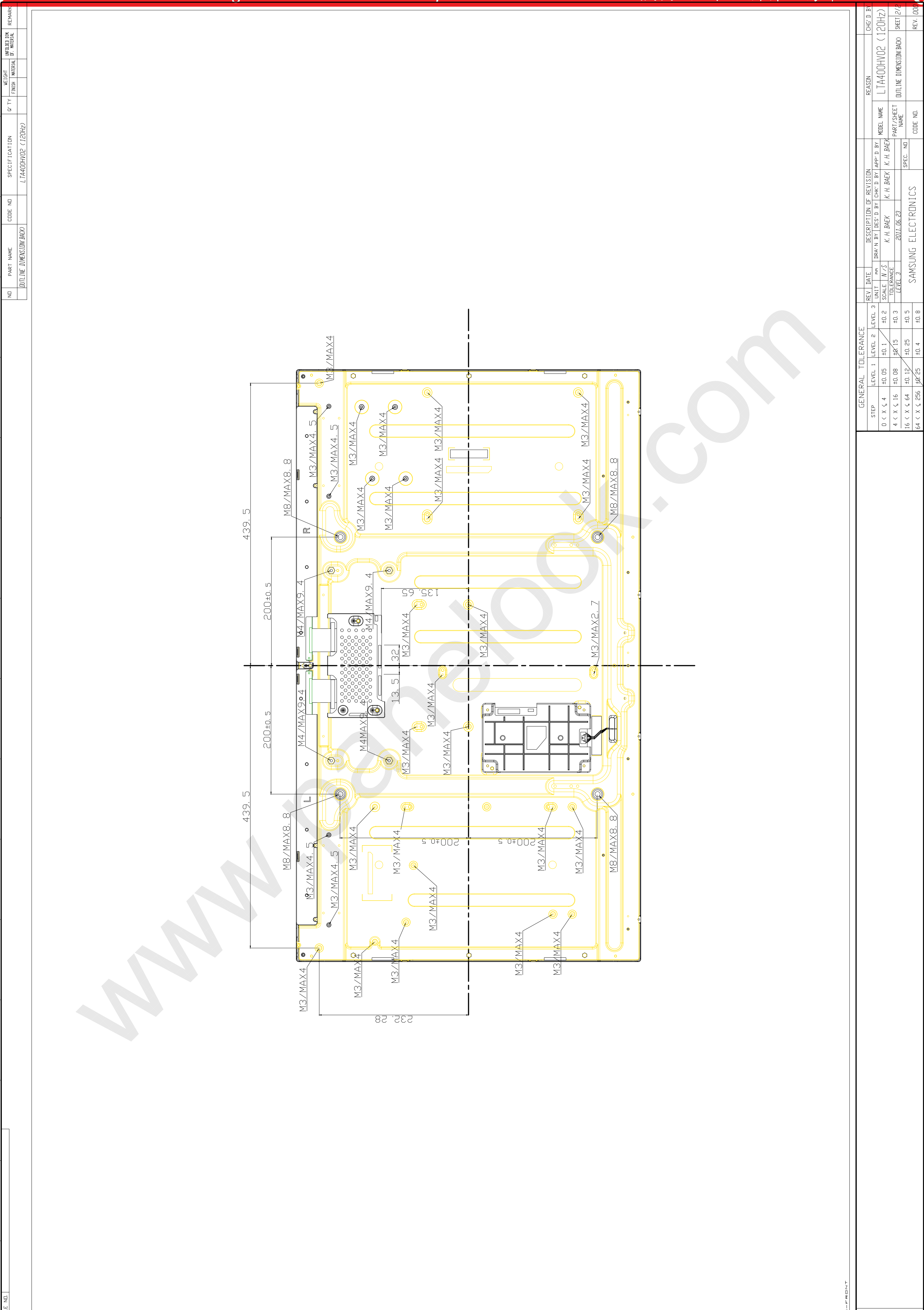
UNIT : mm
SCALE : N/S
TOLERANCE : LEVEL 3

SAMSUNG ELECTRONICS

MODEL NAME	LTA400HV02 (120Hz)
PART/SHEET NAME	OUTLINE DIMENSION(FRONT)
SPEC. NO	
CODE NO.	

REASON | CHG'D BY | SHEET 1/2 | REV. 000

FILE NO.


LTA400HV02 (120Hz)
OUTLINE DIMENSION(BACK)
SAMSUNG ELECTRONICS
GENERAL TOLERANCE
K. H. BAEK
2011.06.23
M3/MAX4
M3/MAX4.5
M8/MAX8.8
M4/MAX9.4
M3/MAX2.7
439.5
200±0.5
135.65
32
13.5
232.28

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8. Reliability Test

Item	Test condition	Quantity
Temperature Step Stress	- 20~ 65℃ 1.9hr 440cycle determination	4EA
HTOL	50℃, 500hr determination	4EA
LTOL	0℃, 500hr determination	4EA
HTS	70℃, 500hr determination	4EA
LTS	-30℃, 500hr determination	4EA
THB	40℃ / 95%RH, 500hr determination	4EA
WHTS	60℃ / 75%RH, 250hr determination	4EA
Thermal Shock	-20 ℃ ~ 60 ℃, 200cycle determination	4EA
ESD(operation)	contact : ±8 kV ,150pF/330Ω,200Point,1 time/Point non-contact : ±15 kV,150pF/330Ω,200Point,1 time/Point	3EA
Converter Input Con. ESD	contact : ±2kV,150pF/330,Input Con.Pin,3 times/Pin	3EA
Vibration	10~300Hz/1.5G/10minSR, XYZ, 30min/axis	3EA
Shock	Half Sine, 50G, 11msec, ± X,Y,Z 1time/axis	3EA
PALLET Vibration	1.05Grms 5~200Hz 1hr	1PALLET(21EA)
PALLET Drop	4 edge 1face(bottom) 20 cm	1PALLET(21EA)

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

* HTOL/ LTOL : High/Low Temperature Operating Life
** THB : Temperature Humidity Bias
*** HTS/LTS : High/Low Temperature Storage
**** WHTS : Wet High Temperature Storage

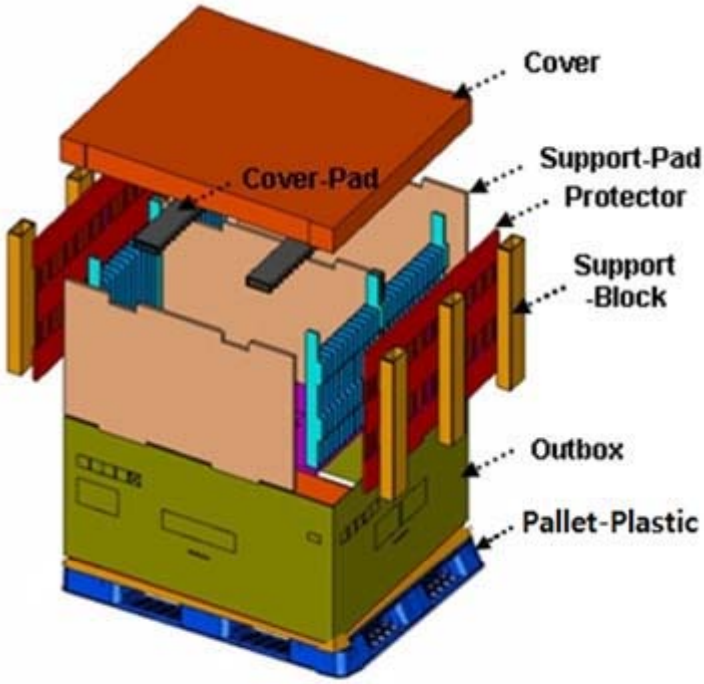
9. PACKING

9.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



9.2 Packing Specification

Item	Specification	Remark
LCD Packing	21a / (Packing-Pallet Box)	1. 180.6 kg / LCD (21ea) 2. 14.0kg / Packing Pallet Box (1set)
Pallet	1Box / Pallet	1. Pallet weight = 5.3kg
Packing Direction	Vertical	
Total Pallet Size	H x V x height	1150mm(L) x 985mm(W) x 711mm(height)
Total Pallet Weight	200.74 kg	Pallet(5.3kg) + Module (180.6kg) +Packing Pallet Box(14kg)

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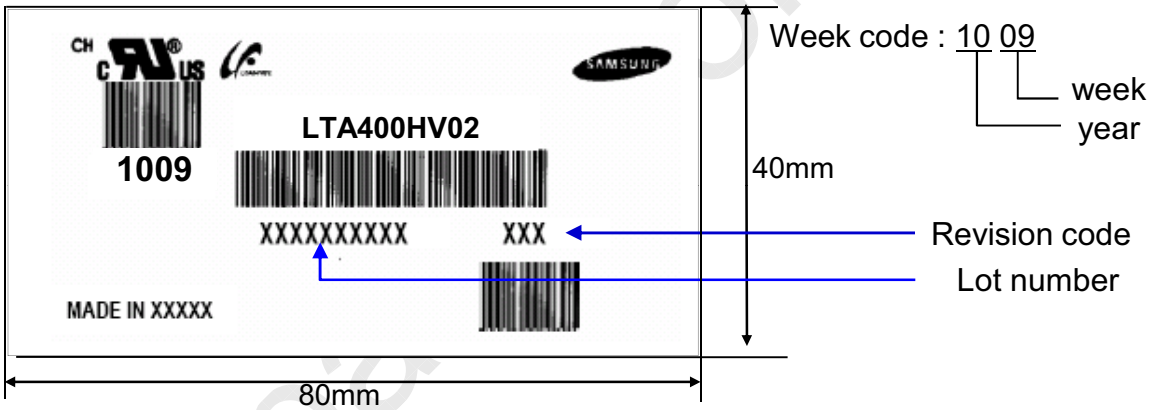
10. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

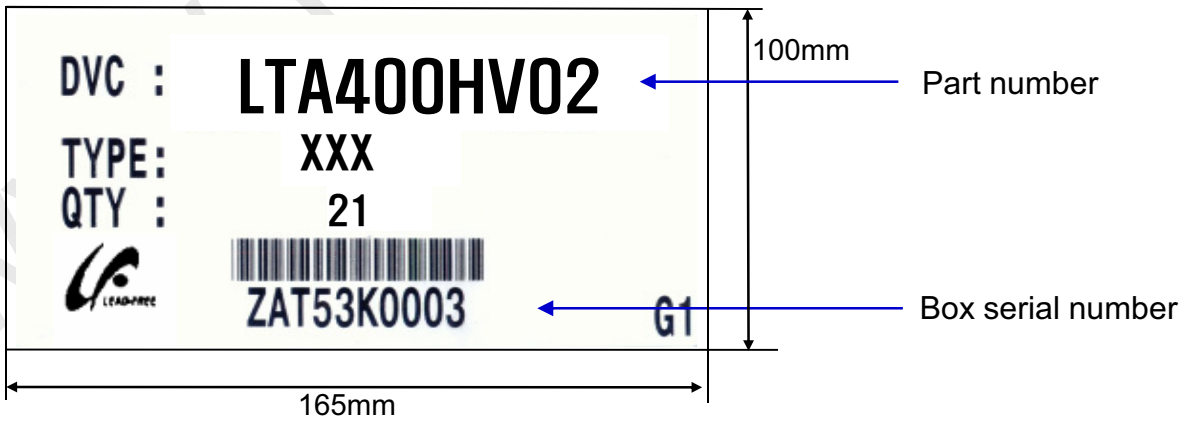
(1) Part number : LTA400HV02
(2) Revision: Three letters
(3) Lot number : X X X X XXX XX X

- Cell Position No. (In the Glass)
- Glass No. (In the one Lot)
- Lot No. (Glass)
- Month
- Year (Note1)
- Product code
- Line

(4) Nameplate Indication



(5) Packing box attach



11. General Precautions

11.1 Handling

(a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.

(b) Because the Converter use high voltage, it should be disconnected from power before it is assembled or disassembled.

(c) Refrain from strong mechanical shock and / or any force to the Module. In addition to damage, this may cause improper operation or damage to the Module and back light.

(d) Note that polarizers are very fragile and could be damage easily. Do not press or scratch the surface harder than a HB pencil lead.

(e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.

(f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.

(g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.

(i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or semiconductor would be damaged.

(j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(k) Do not disassemble the Module.

(l) Do not disassemble shield case of Converter & LVDS board

(m) Do not connect N.C pins. (Samsung internal use only)

(n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handling a module

(o) Pins of I/F connector should not be touched directly with bare hands.

11.2 Storage

(a) Do not leave the Module in high temperature, and high humidity for a long time. It is highly recommended to store the Module with temperature from 5 to 40℃ and relative humidity of less than 70%.

(b) Do not store the TFT-LCD Module in direct sunlight.

(c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.

(d) Storage period is recommended not to exceed 1 year.

11.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back light connector and its Converter power supply should be connected directly with a minimized length. A longer cable between the back light and the Converter may cause lower luminance of LED and may require higher startup voltage(Vs).

11.4 Operation Condition Guide

(a) The LCD product should be operated under normal conditions.
Normal condition is defined as below;
- Temperature : 20± 15℃
- Humidity : 55± 20%
- Display pattern : continually changing pattern (Not stationary)

(b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

11.5 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)
Otherwise the Module may be damaged.

(d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
To avoid image sticking, it is recommended to use a screen saver.

(e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(f) Please contact SEC in advance when you display the same pattern for a long time.